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None

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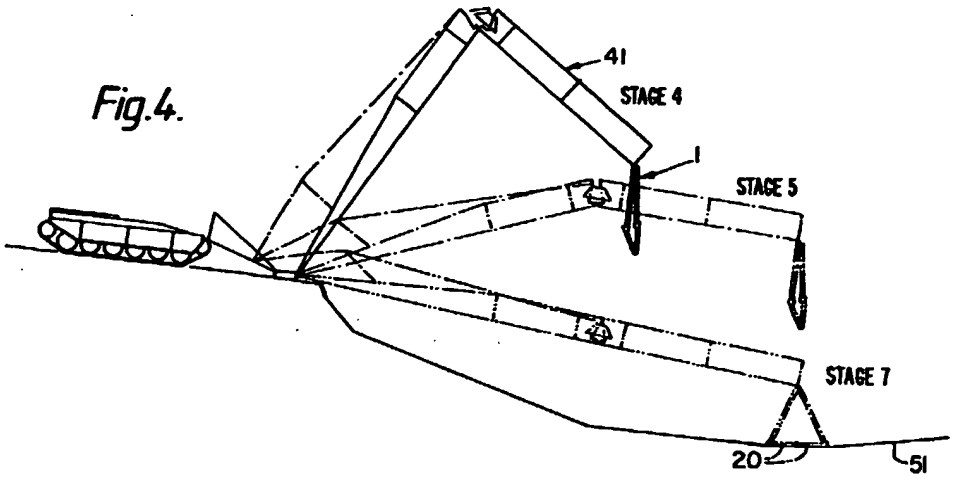
(54) Abstract Title
Support trestle for transportable bridge spans

(57) A folding trestle (1) arranged for pendent attachment to a bridge span (41) for launch with the span from a near-end emplacement site so as to self-deploy remotely at the far-end emplacment site. When the trestle is lowered to the ground it unfolds to engage a pair of grillage plates (20) with the ground and thereby provide a stable, triangular prism - shaped support upon which the span comes to rest. Use of the trestle provides an improved capability for collinearly deploying plural spans so as to provide longer bridges.

Fig.4.



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

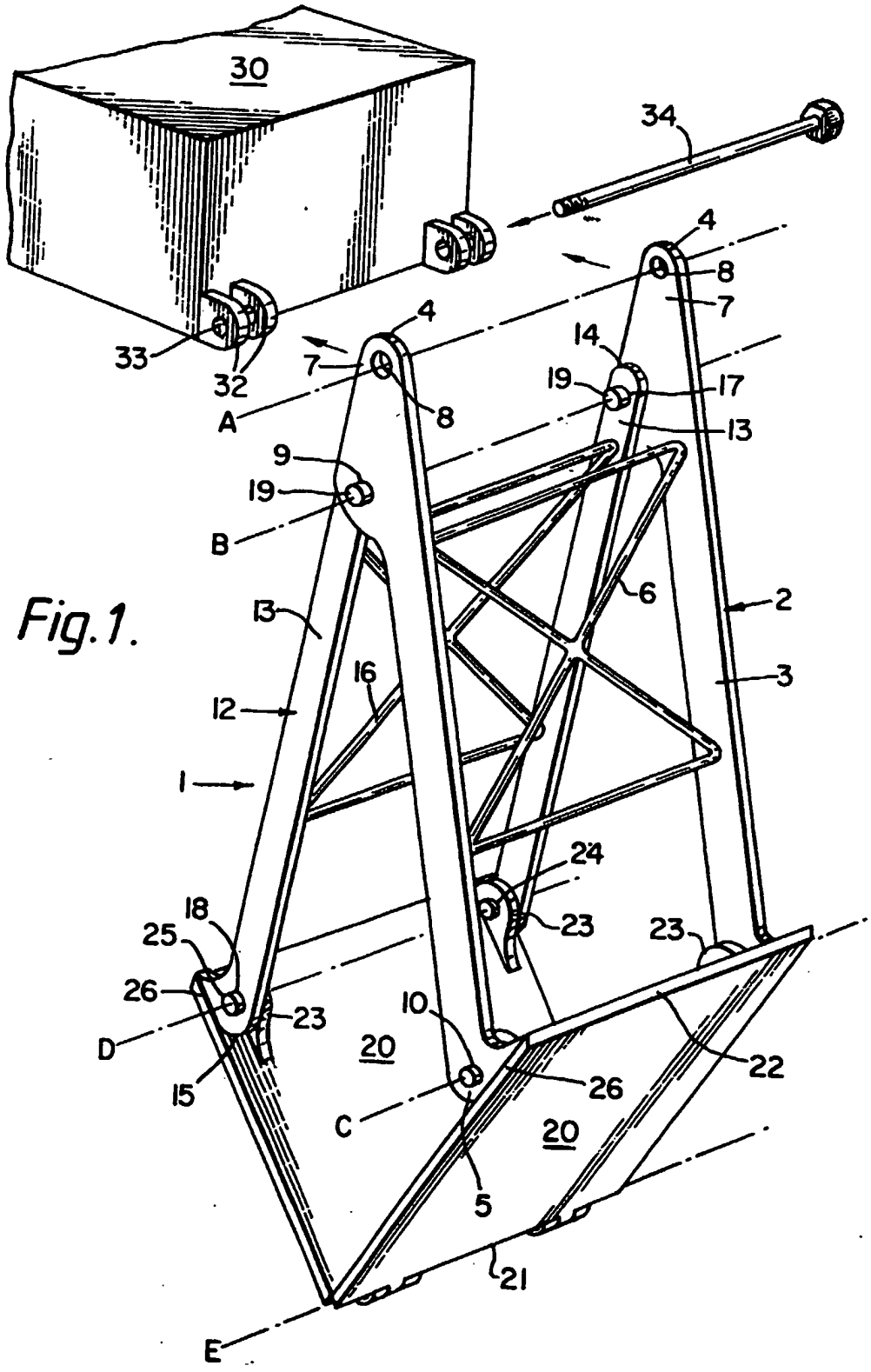
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Fig. 1.

Fig. 2.

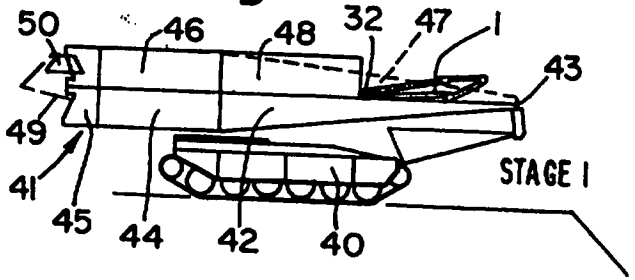


Fig. 3.

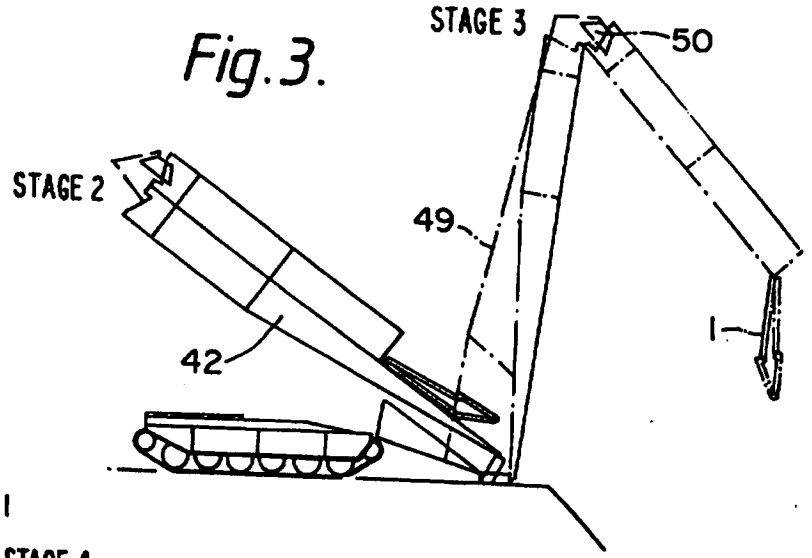
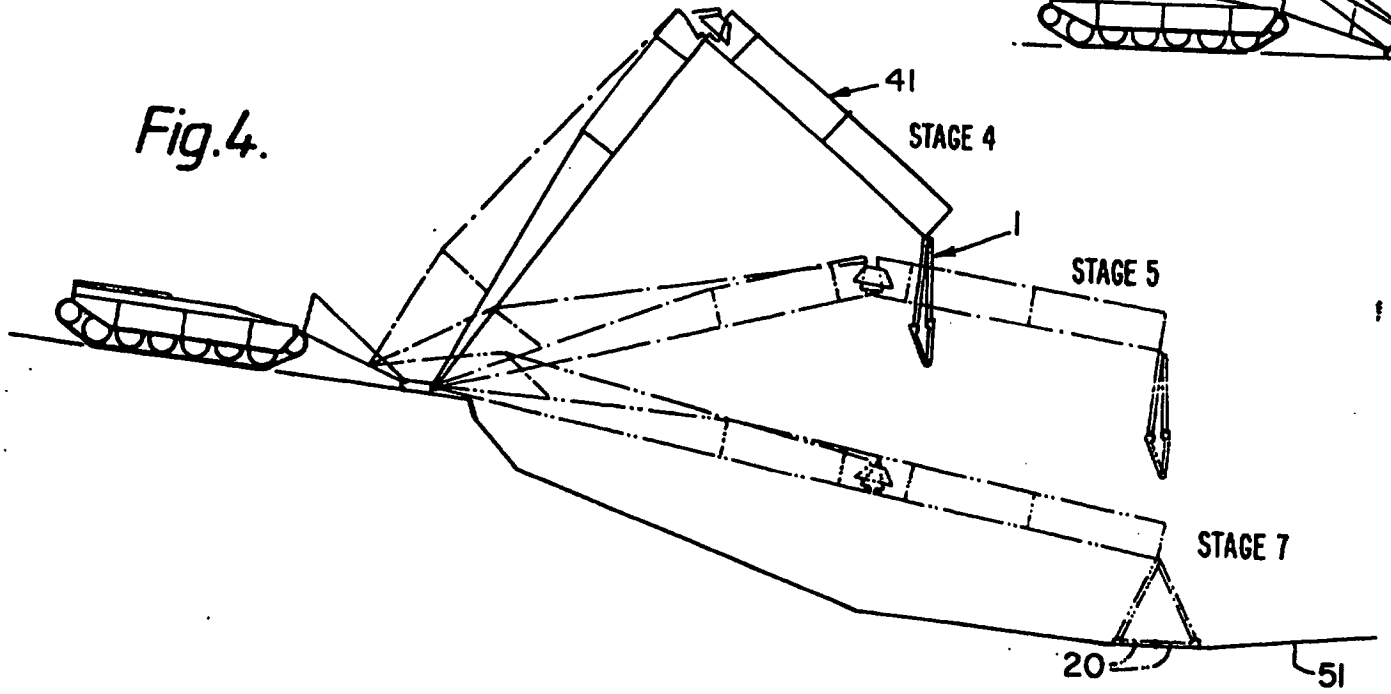


Fig. 4.



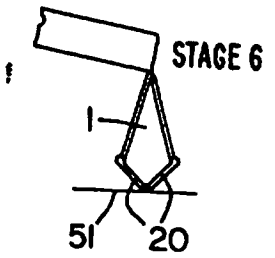


Fig. 5.

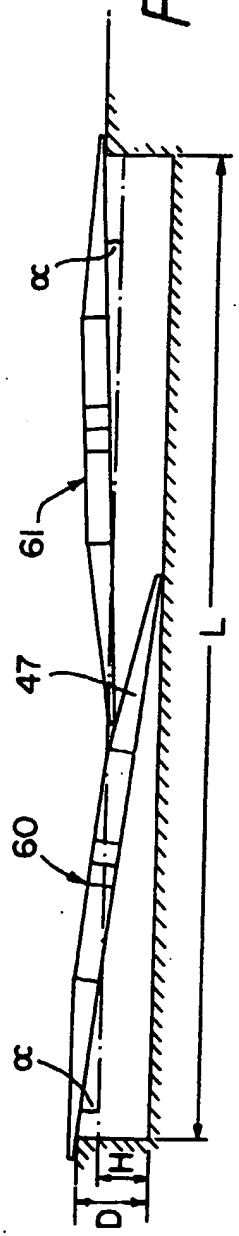


Fig.6.

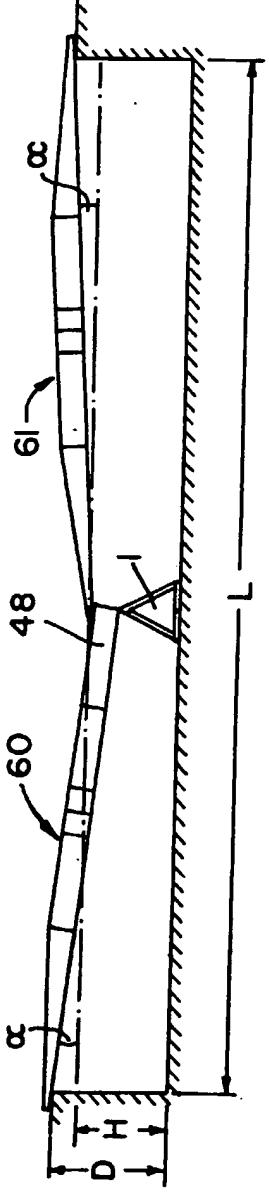


Fig.7.

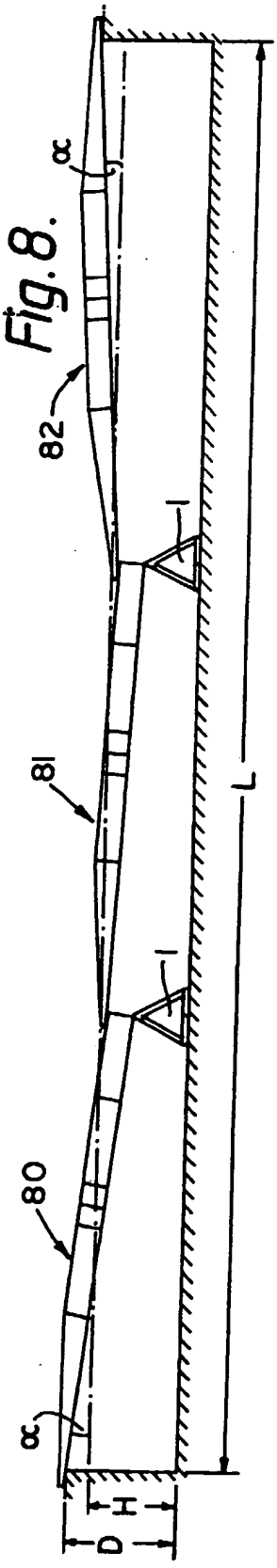


Fig.8.

SUPPORT TRESTLE FOR TRANSPORTABLE BRIDGE SPANS

This invention relates to a support trestle which can be remotely deployed with a transportable bridge span and is applicable for use in any launching system in which the end of the span that is remote from the launch site, ie the far end, is eventually emplaced at its chosen far site in a vertically downwards direction.

Various launching systems resulting in this manner of emplacement are known. For example, 'overhead' launch in which a span is lowered into position from an overhead launch rail, 'inverted' launch in which an inverted span is rotated up and over one of its ends, 'scissors' launch, which is an extension of the inverted launch and includes a second span hinged to and folded against the inverted span, which second span is unfolded by a scissoring action at the hinge as the inverted span rotates.

A limitation of most launch systems is that if the gap to be bridged is greater than the maximum single span available, a bridge support structure such as a pier or a trestle must be built and deployed at an intermediate site to support the far end of the span before adding a further span to reach the desired far site. The provision of intermediate support structure is time consuming and can occasionally involve undesirable exposure of the personnel employed in its deployment.

When the gap to be bridged is sufficiently shallow, the use of a support structure can sometimes be avoided by using a known method of 'combination bridging' in which the far end of the first span is lowered to rest upon the bed of the gap to be bridged and the near end of a second span is then placed upon the first span at an appropriate longitudinal location permitting its far end to extend to the chosen far site and also providing a conjoined span of sufficient elevation for an effective crossing, ie above water level and without too much slope. This method too has its limitations in that the depth of gap that can be bridged is limited and also in that considerable overlap of the two spans is required, particularly if the water level is high in the gap, and the consequently small additional length gained is an inefficient use of available spans.

The present invention seeks to provide a span support structure

that can be launched with the span for remote deployment at the desired emplacement site, and can be folded away with the span for stowage and transportation.

In accordance with the present invention, a support trestle for a transportable bridge span includes: a first leg frame having mutually parallel head and foot extremities, the head extremity being provided with suspension means pivotally attachable to the bridge span so as to permit pensile rotation of the frame about a suspension axis parallel with the head and foot extremities; a second leg frame having mutually parallel head and foot extremities disposed parallel with the suspension axis, the head extremity being pivotally attached to the first leg frame so as to permit relative rotation of the two frames about a head pivot axis parallel with and adjacent the suspension axis; and a pair of grillage plates each having mutually parallel outer and inner edges disposed parallel with the suspension axis, each outer edge being pivotally attached to the foot extremity of a respective one of the two leg frames so as to permit relative rotation of the grillage plate and the respective leg frame about a foot pivot axis parallel with the suspension axis, and both inner edges being pivotally interconnected so as to permit relative rotation of the two grillage plates about a grillage pivot axis parallel with the suspension axis.

Conveniently the suspension means may comprise at least two pierced lugs located in line along the suspension axis so as to permit axial insertion of a pivot pin throughout the lugs, the bridge span being similarly provided at its far end with a corresponding line of pierced lugs disposed so as to lie in a substantially horizontal plane when the span is deployed, which lugs may be interdigitated with those of the trestle prior to insertion of the pivot pin. Orientation of the span lug line within the said plane, and hence the disposition of the suspension axis when the trestle is attached, may advantageously be perpendicular to the longitudinal axis of the bridge span so as to permit the trestle to be folded in line with the span for stowage purposes.

Preferably, stop means are provided interjacent each leg frame and its conjoined grillage plate so as to inhibit complete closure of

the two foot pivot axes towards one another, and further stop means are provided interjacent the two grillage plates for inhibiting compete closure of the grillage pivot axis towards the head pivot axis.

An embodiment of the invention will now be described by way of example only, with reference to the following drawings, of which Figure 1 is an isometric view of a support trestle in suspended, folded condition together with a conjoining end portion of a trackway span,

Figures 2-5 are diagrammatic side views of the same trestle attached to a scissors-opening trackway span and launch vehicle, depicting the various stages of launch and emplacement,

Figure 6 is a diagrammatic side view of two trackway spans disposed in conventional combination bridging arrangement; and

Figures 7 and 8 are diagrammatic side views of plural trackway spans disposed in similar manner to those of Figures 6 but with the use of the trestle illustrated in Figure 1.

The embodiment illustrated in Figure 1 consists of a trestle 1 having a first leg frame 2 comprising two legs 3 each having a head extremity 4 and a foot extremity 5, the legs being connected in parallel by latticed cross bracing 6.

Each leg 3 extends at its head extremity 4 into a lug 7, both lugs being provided with suspension pivot holes 8 aligned on a suspension axis A. Each leg 3 is provided with a head pivot hole 9, both holes 9 being disposed in axial alignment on a head pivot axis B adjacent and parallel to the axis A, and a foot pivot hole 10, both holes 10 being disposed in axial alignment on a first foot pivot axis C also parallel with the axis A.

A second leg frame 12 located interjacent the two head extremities 4 of the legs 3 and comprising two legs 13 each having a head extremity 14 and a foot extremity 15, the legs being connected in parallel by latticed cross bracing 16, is similarly provided with head and foot pivot holes 17 and 18 respectively aligned on the head pivot axis B and on a parallel second foot pivot axis D. Each co-adjacent pair of the head pivot holes 9 and 17 of the two leg frames respectively are pinned through with pivot pins 19.

Two rectangular grillage plates 20, each having an inner edge 21 and an outer edge 22, are hinged together at the edges 21 so as to be relatively rotatable about a grillage pivot axis E also parallel with the axis A. Each outer edge 22 is provided with a pair of lugs 23 having holes 24 which are aligned with the foot pivot holes 10 and 18 of the legs 3 and 13 respectively, each co-adjacent pair of holes being pinned through with pivot pins 25.

The extent of closure of the grillage pivot axis E towards the suspension axis A, is limited by the edges 21 of the plates 20, which edges are dimensioned to co-engage slightly beyond the point at which the foot pivot axes C and D reach their maximum separation ie, the point at which the plates plates 20 become coplanar, thereby to provide adaptability to uneven ground.

Also illustrated in Figure 1 is the end of a trackway span 30 provided with corresponding suspension means comprising two pairs of lugs 32 all having pivot holes 33 disposed in axial alignment. In use, the complete trestle 1 is pivotally suspended from the span 30 by interdigitating the lugs 7 with the lugs 32 and pinning through the co-aligned holes 8 and 33 with a suspension pin 34.

When suspended from the span 30, the trestle 1 hangs in an unbraced condition as drawn, complete closure together of the two foot pivot axes C and D being prevented both by the horizontal off-set of the head pivot axis B from the vertical plane of symmetry defined by the axes A and E, and by the engagement of the plates 20 with a stop edge 26 provided at the foot of each leg 3 and 13.

When the trestle is lowered vertically to the ground, the pivotally conjoined inner edges 21 of the grillage plates 20 will engage the ground first, causing the grillage pivot axis E to be pushed upwards and the two foot pivot axes C and D to be levered apart until maximum separation is achieved. The thus extended grillage plates 20 are then held locked in this condition by their engagement with the ground and act as a brace to hold the trestle in stable triangular prism form. Even when the plates are inhibited from full opening by engagement with uneven ground, their reaction with the ground will still provide effective bracing of the trestle to hold it in a stable form.

The grillage plates 20 are preferably provided at their ground engagement faces with an array of projections (not shown) to increase engagement with the ground, but these should not be so aggressive as to cause damage if the trestle is to be used on a protected surface, eg a canal bottom with a waterproof lining. The area of the grillage plates should also be selected to spread the load sufficiently to remove risk of damage.

Application of the trestle 1 to a span launch will now be described with reference to Figures 2-5 which together depict seven stages of a scissors launch from a launch vehicle 40 of a parallel pair of identical folding trackway spans, only one of which, span 41, is illustrated and discussed.

The span 41 conventionally comprises a near end 42 having a launch pivot extremity 43, a near end girder 44, a hinge 45, a far end girder 46 and a far end ramp 47 (shown in broken lines in Figure 2). When the trestle 1 is to be attached, the far end ramp 47 is replaced by a girder 48 having at its far end the lugs 32 previously described with reference to Figure 1, to which the trestle 1 is rotatably pinned.

When stowed for transport (Stage 1, Figure 2), the trestle 1 rests in its folded condition upon the ramp 42 in line with the girder 48, lying substantially within the envelope of the replaced ramp 47.

Conventional scissors launch of the span, depicted throughout Stages 2-7, is achieved by rotating the folded span 41 upwards and over the launch pivot extremity 43, unfolding being engendered by the action of a tie 49 secured between a scissoring attachment 50 at the hinge 45 and the launch vehicle 40. The trestle 1 remains in unbraced condition throughout the Stages 1-5, becoming pensile from the girder 46 once it has swung free of the ramp 42 (Stages 3, 4 and 5). As soon as the inner edges 21 of the grillage plates 20 engage the ground 51 (Stage 6, Figure 5) the trestle begins to open out, eventually to achieve its braced triangular prism form and thereby become supportive of the trackway span (Stage 7, Figure 4).

Advantageous use of the trestle as an intermediate support pier for bridging shallow gaps with a plurality of spans will now be

discussed with reference to Figures 6-8. Figure 6 depicts two conventional trackway spans 60 and 61 laid across a shallow gap of depth D in the known combination bridging arrangement hereinbefore discussed. It will be readily seen that both the depth D and the achievable joint span length L are limited by the maximum permissible angle of slope & that can be tolerated for safe transit across the trackway span. In addition, the length L is further limited in a wet gap by the height of water H, the extent of overlap of the span 61 onto the span 60 needed for a dry crossing being dependent upon H.

Figure 7 depicts a similar double span, but this time the ramp 47 (Figure 6) of the span 60 has been replaced by the girder 48 and the trestle 1, as previously described with reference to Figure 2. Clearly use of the trestle has extended the length L of the joint spans achievable at the same angle of slope d, as well as increasing the maximum values of H and D that can be tolerated, by an amount that is dependent upon the height of the trestle.

The use of the trestle 1 enables this bridging technique to be extended to the addition of further spans, as illustrated in Figure 8. In this bridge arrangement two sequentially launched trackway spans 80 and 81, each fitted with a trestle 1, support a conventional end span 82 to provide a total span of proportionately increased length L. It will be apparent that various arrangements of spans with trestles, eg span 80, can also be employed singly or plurally without further conventional spans to provide jetties or landing stages.

CLAIMS

1. A support trestle for a transportable bridge span including: a first leg frame having mutually parallel head and foot extremities, the head extremity being provided with suspension means pivotally attachable to the bridge span so as to permit pensile rotation of the frame about a suspension axis parallel with the head and foot extremities; a second leg frame having mutually parallel head and foot extremities disposed parallel with the suspension axis, the head extremity being pivotally attached to the first leg frame so as to permit relative rotation of the two frames about a head pivot axis parallel with and adjacent the suspension axis; and a pair of grillage plates each having mutually parallel outer and inner edges disposed parallel with the suspension axis, each outer edge being pivotally attached to the foot extremity of a respective one of the two leg frames so as to permit relative rotation of the grillage plate and the respective leg frame about a foot pivot axis parallel with the suspension axis, and both inner edges being pivotally interconnected so as to permit relative rotation of the two grillage plates about a grillage pivot axis parallel with the suspension axis.

2. A support trestle as claimed in Claim 1 wherein the suspension means comprises at least two pierced lugs located in line along the suspension axis so as to permit axial insertion of a pivot pin throughout the lugs, the bridge span being similarly provided with a corresponding line of pierced lugs located so as to interdigitate with those of the trestle and disposed so as lie in a substantially horizontal plane when the span is deployed.

3. A support trestle as claimed in Claim 2 wherein the disposition of the suspension axis is perpendicular to the longitudinal axis of the bridge span when the trestle is attached thereto.

4. A support trestle as claimed in any of the preceding Claims wherein stop means are provided interjacent the pair of grillage plates for inhibiting complete closure of the grillage pivot axis towards the head pivot axis.

5. A support trestle as claimed in any one of the preceding Claims wherein stop means are provided interjacent each leg frame and its conjoined grillage plate so as to inhibit complete closure of the two foot pivot axes towards one another.

6. A support trestle substantially as hereinbefore described with reference to the accompanying drawings.

PATENTS ACT 1977
EXAMINER'S REPORT TO THE COMPTROLLER
UNDER SECTION 17(5)
(The Search Report)

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Application No.

8504146

FIELD OF SEARCH: The search has been conducted through the relevant published UK patent specifications and applications, and applications published under the European Patent Convention and the Patent Co-operation Treaty (and such other documents as may be mentioned below) in the following subject-matter areas:-

UK Classification E1G

(Collections other than UK, EP & PCT:) Selected US

DOCUMENTS IDENTIFIED BY THE EXAMINER (NB In accordance with Section 17(5), the list of documents below may include only those considered by the examiner to be the most relevant of those lying within the field (and extent) of search)

Category	Identity of document and relevant passages	Relevant to claim(s)
	None	

CATEGORY OF CITED DOCUMENTS

X relevant if taken alone
Y relevant if combined with another cited document
P document published on or after the declared priority date but before the filing date of the present application
E patent document published on or after, but with priority date earlier than, the filing date of the present application

Search examiner R C Watling

Date of search 21 October 1985

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